



First records and range extension of Bristle-spined Porcupine, *Chaetomys subspinosus* (Olfers, 1818) (Rodentia, Erethizontidae), in Minas Gerais state, Brazil

Flávio Kulaif Ubaid^{1*}, Tarcilla Valtuille², Helbert Sansão², João Marques Lima², Adriano Garcia Chiarello³, Fernando Lima⁴, Daniel da Silva Ferraz⁵, Fabiano Rodrigues de Melo^{6,7,8}

1 Laboratório de Ornitologia, Universidade Estadual do Maranhão, Caxias, Maranhão, Brazil • FKU: flavioubaid@gmail.com <http://orcid.org/0000-0001-8604-1206>

2 Juma Consultoria Ambiental, Brasília, DF, Brazil • TV: tarcilla@juma.bio.br <https://orcid.org/0000-0003-2053-0802> • HS: helbert@juma.bio.br

3 Laboratório de Ecologia e Conservação, Universidade de São Paulo, Ribeirão Preto, São Paulo, Brazil • AGC: bradypus@ffclrp.usp.br <https://orcid.org/0000-0003-1914-5480>

4 Algoritmo: Ciência e Tecnologia, Atibaia, São Paulo, Brazil • FL: pardalimits@gmail.com <https://orcid.org/0000-0002-8644-9647>

5 Rede Eco-Diversa para Conservação da Biodiversidade, Tombos, Minas Gerais, Brazil • DSF: ferrazds2@gmail.com <https://orcid.org/0000-0001-7919-1433>

6 Muriqui Instituto de Biodiversidade, Caratinga, Minas Gerais, Brazil • FRM: frmelo@ufv.br <https://orcid.org/0000-0001-9958-2036>

7 Departamento de Engenharia Florestal, Universidade Federal de Viçosa, Viçosa, Minas Gerais, Brazil

8 Centro de Estudos de Conservação dos Saguís-da-Serra, Universidade Federal de Viçosa, Viçosa, Minas Gerais, Brazil

* Corresponding author

Abstract

We report from three localities four new records of the threatened Brazilian Atlantic Forest endemic *Chaetomys subspinosus* (Olfers, 1818). These are the first records of this porcupine species from the state of Minas Gerais, and these new data extend the distribution of this species by approximately 220 km to the southwest. As *C. subspinosus* was observed in areas of transitional vegetation, this species may be found in a much broader spectrum of habitat types than previously thought. We recommend further surveys focusing on documenting this species.

Keywords

Atlantic Forest, biogeography, Bristle-spined Rat, distribution, endangered, endemic, Mammalia

Academic editor: Guilherme Garbino | Received 27 September 2021 | Accepted 16 December 2021 | Published 4 January 2022

Citation: Ubaid FK, Valtuille T, Sansão H, Lima JM, Chiarello AG, Lima F, Ferraz DS, Melo FR (2022) First records and range extension of Bristle-spined Porcupine, *Chaetomys subspinosus* (Olfers, 1818) (Rodentia, Erethizontidae) in Minas Gerais state, Brazil. Check List 18 (1): 11–15. <https://doi.org/10.15560/18.1.11>

Introduction

Chaetomys subspinosus (Olfers, 1818), Bristle-spined Porcupine, is an arboreal and nocturnal rodent. This solitary porcupine has a folivorous diet, and a mean weight

of 1,600 g (Eisenberg and Redford 1999; Giné et al. 2010; Voss et al. 2013). This species is endemic to the Brazilian Atlantic Forest, occurring in the Bahia biogeographical

subregion (Oliver and Santos 1991; Ribeiro et al. 2009), where it is found primarily in the eastern extremes of the biome, from southern Sergipe to eastern and southern Bahia and southern Espírito Santo states (Giné and Faria 2018). *Chaetomys subspinosus* was recorded recently in the eastern portion of the Caparaó National Park in the state of Espírito Santo at border with Minas Gerais state (Kaizer et al. 2021), which represents the westernmost locality recorded to date. From the state of Minas Gerais, there is only indirect evidence of the occurrence of *C. subspinosus*, based on interviews with local residents (Oliver and Santos 1991; Giné and Faria 2018). Giné and Faria (2018) provided the most recent review of the geographic distribution of *C. subspinosus* (117 georeferenced localities of occurrences), including field data, published records, and specimens in scientific collections, in addition to the modeling of the potential distribution of the species.

Chaetomys subspinosus is found in primary and secondary forests, as well as coastal restingas (Moojen 1952; Oliver and Santos 1991; Chiarello et al. 1997; Oliveira et al. 2012), with some records from shaded cocoa plantations (Oliver and Santos 1991). The species has a clear preference for patches of native vegetation with complex vertical structure (Giné 2009). *Chaetomys subspinosus* is listed as Vulnerable by the IUCN (Catzeflis et al. 2017) and the Brazilian Ministry of the Environment (ICMBio 2018) due to population declines caused by deforestation and hunting pressure (Castilho et al. 2013).

The paucity of field records of *C. subspinosus* has been attributed to this species' cryptic behavior, which has led, in turn, to a large part of its geographic distribution being defined on the basis of indirect evidence, primarily interviews with local residents (Oliver and Santos 1991; Giné and Faria 2018). This emphasizes the need for more systematic surveys, based on direct observations, in particular in Sergipe, northeastern Minas Gerais, and northwestern Espírito Santo (Giné and Faria 2016), for better definition of the distribution limits of the species. Here we present from three new localities four new records of *C. subspinosus* in the Brazilian state of Minas Gerais, based on direct observations of individuals or body parts in the field. Two of the records are outside the known distribution of the species.

Methods

We conducted diurnal and nocturnal line-transect surveys (Buckland et al. 2001) of mammals between 2002 and 2004 in eight different fragments of forest located in the valleys of the Mucuri and Jequitinhonha rivers in Minas Gerais. Transects were walked along pre-existing trails and dirt roads, located both within and at the edge of the forest (for details, see Melo et al. 2018). We also surveyed areas in the municipality of Bandeira, in Minas Gerais, between 2017 and 2019.

To define the known distribution of *C. subspinosus*, we considered the existing records reviewed by Giné

and Faria (2018) and the recent record from the Caparaó National Park (Kaizer et al. 2021).

Results

Chaetomys subspinosus (Olfers, 1818)

Figures 1, 2

New records. BRAZIL – Minas Gerais • Jordânia, Fazenda Serra Azul; –15.8000, –040.5166; 860 m a.s.l.; 19.III.2003; Fabiano Melo, Daniel Ferraz, Fernando Lima (obs.); dense montane rainforest • same locality; 8.VII.2004; Adriano Chiarello, Fernando Lima (obs.); 1 adult • Bandeira; –15.8847, –040.5347; 545 m a.s.l.; 18.VIII.2017; Helberth Sansão (obs.); 1 adult • Monte Formoso; –16.9702, –041.2841; 760 m a.s.l.; 11.V.2019; João Lima (obs.); 1 adult.

The records from Fazenda Serra Azul are based on two different types of evidence. In the first record, about 50 spines of *C. subspinosus* (Fig. 2A) were found during a field expedition that was part of the project “Biodiversity and Conservation of the Valleys of the Jequitinhonha and Mucuri rivers” (PROBIO/Conservation International). It was not possible to determine what had caused the quills to detach, given that no other remains were found at the site, but it is likely that the animal was captured by a predator. In the second record, an adult *C. subspinosus* was sighted at approximately 17:00 h resting in the crown of a tree in a tract of dense montane rainforest (Fig. 2B). The third record was obtained at around 10:00 h, when an adult was observed moving in the crown of a tree at a height of approximately 10 m, near the edge of a fragment of forest. This individual was observed for a few minutes before it went out of sight into an area of denser vegetation (Fig. 2C). The fourth record was obtained at approximately 11:00 h, where an individual was encountered while clearing vegetation for the installation of a transmission line (Fig. 2D). The animal was first sighted crossing a clearing and it then climbed a tree. After being observed for a few minutes, the animal moved into the denser vegetation and out of the line of sight of the observers.

Identification. Spines found alone and live animals were identified by the following combination of diagnostic characteristics: tricolored spines with pale yellow bases, dark brown middles, and pale brown tips; a tapering, long, prehensile and thinly-haired tail, becoming almost naked toward the tip; “head and shoulders evenly and densely covered with short (c. 15 mm), kinky spines that stand up and are sharp at tips”; “spines extending onto dorsal pelage to rump and on legs and base of the tail, and in contrast to spines on head, these are non-defensive, longer (c. 50 mm) spines lacking hard, sharp points” (Barthelme 2016: 391).

Discussion

The new records presented here are the first documentation of *Chaetomys subspinosus* from the Brazilian

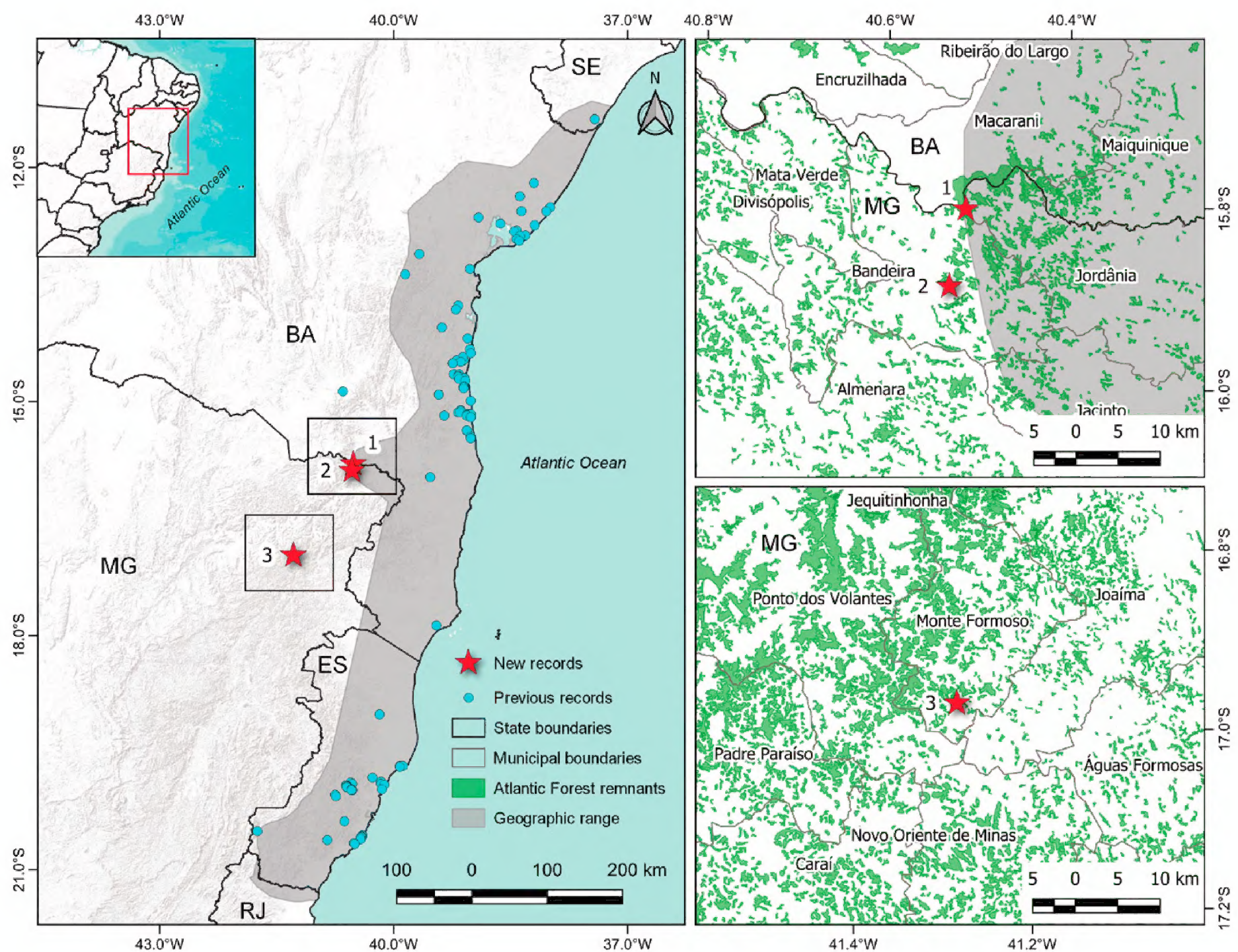


Figure 1. First records of *Chaetomys subspinosus* from the Brazilian state of Minas Gerais (MG), showing the existing localities in the states of Bahia (BA), Sergipe (SE), and Espírito Santo (ES). Geographic range according to Catzefflis et al. (2017), from north Rio de Janeiro (RJ) to south SE. Previous records compiled from Giné and Faria (2018) and Kaizer et al. (2021).

state of Minas Gerais. Previous evidence of the species presence was based solely on interviews with local residents (Oliver and Santos 1991; Giné and Faria 2018). The record from Monte Formoso extends the known distribution of the species by approximately 110 km and is 220 km southwest of the nearest documented localities in the municipalities of Itapebi and Nova Viçosa, both in the state of Bahia (Giné and Faria 2018). The record from Bandeira, while near the projected distribution of the species (Catzefflis et al. 2017), is approximately 110 km west of the nearest confirmed locality in the municipality of Itapebi, Bahia (Oliver and Santos 1991).

In Bandeira, the characteristics of the forest in which *C. subspinosus* was observed, the humid local climate, and the tree species identified at the site, were all consistent with typical dense submontane rainforest (Melo et al. 2018). Giné and Faria (2018) suggested that this species has a marked preference for this type of forest, which would account in part for its occurrence predominantly in the humid coastal forests of eastern Brazil. However, Monte Formoso is located within a transition zone between the dense rainforests of eastern Brazil and the more seasonal, semi-deciduous forest of the interior (Silva and Casteleti 2003), in this case, within the Jequitinhonha basin.

Chaetomys subspinosus populations are extremely sensitive to habitat loss, abruptly becoming rare when the remaining forest cover reaches less than 10%, on a scale of approximately 5,000 km² (Giné and Faria 2018). This means that deforestation rates in the Brazilian Atlantic Forest are close to the limit of the tolerance of this species on a regional scale (Giné and Faria 2018). Currently, environments that are most adequate for *C. subspinosus* cover only 16% of the species' potential area of occurrence, that is, approximately 16,813 km² (Giné and Faria 2018). While no reliable data are available on the demographic parameters of *C. subspinosus*, its populations are thought to be declining rapidly (Giné and Faria 2018), given that native forest areas within its distribution have been suppressed and fragmented extensively (SOS Mata Atlântica 2020).

Based on these findings, we recommend further surveys focusing specifically on detecting *C. subspinosus* in the largest forest fragments within the region delimited by the new records presented here. We also recommend surveying the largest forest remnants in adjacent areas. Potential areas for surveys in the state of Minas Gerais include Mata Escura Biological Reserve, Alto Cariri State Park, Mata dos Muriquis State Wildlife Refuge, and the western portion of Caparaó National Park.

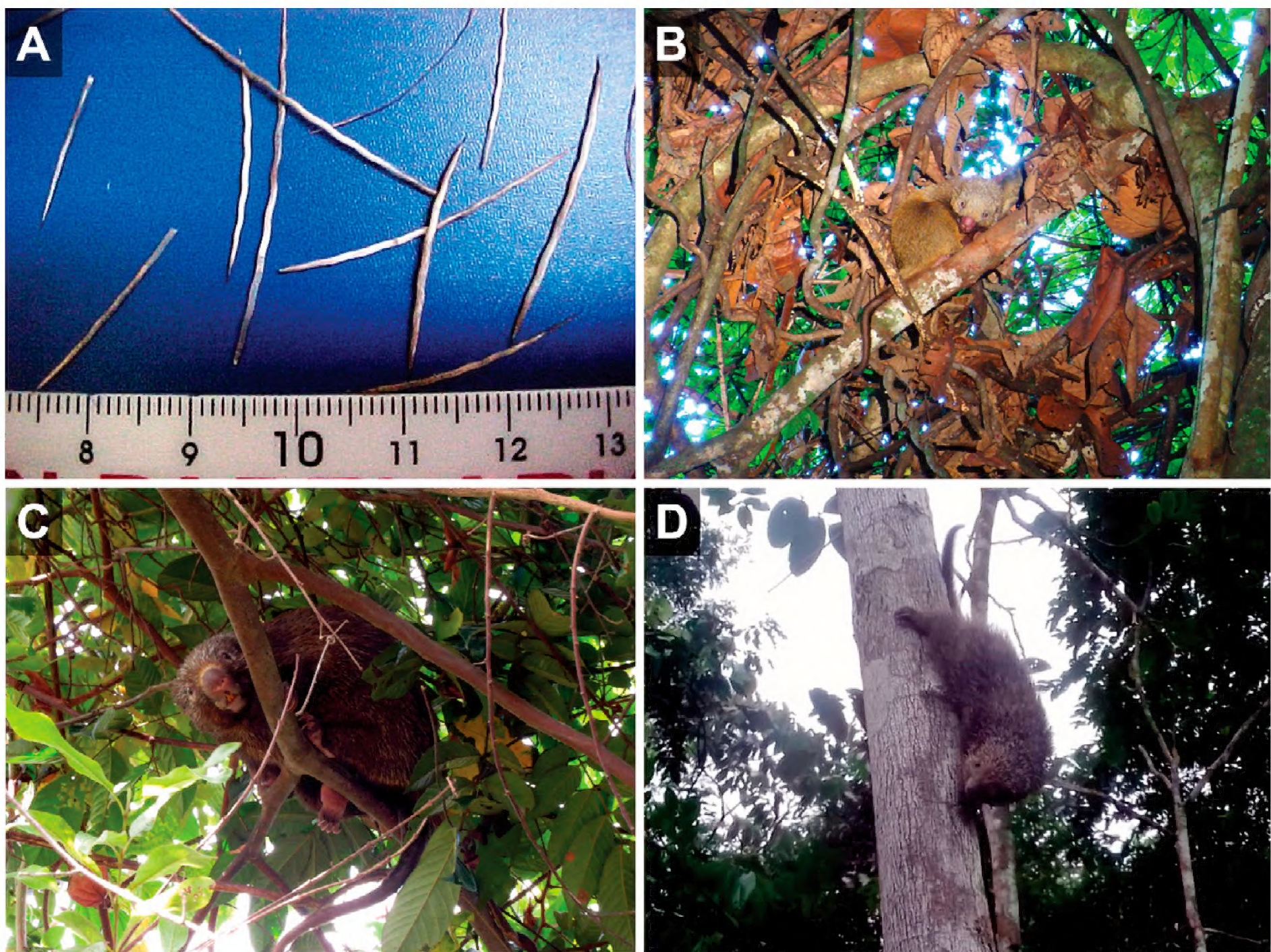


Figure 2. *Chaetomys subspinosus*: (A) quills and (B) an adult on the Fazenda Serra Azul, in the municipality of Bandeira, Minas Gerais (MG); (C) adult observed in the municipality of Bandeira, Minas Gerais; (D) adult recorded in the municipality of Monte Formoso, MG. Photo credits: (A) F. Lima, (B) A.G. Chiarello, (C) H. Sansão, and (D) J.M. Lima.

As *C. subspinosus* was observed in areas of transitional vegetation, the species may occur in a broader spectrum of habitat types than previously thought. It seems likely, however, that the species is not found in the northeastern extreme of the state of Rio de Janeiro, as there was no evidence of this and models predicted unsuitable climatic conditions (Giné and Faria 2018). Finally, studies on connectivity among populations in this fragmented landscape can help to improve conservation strategies that promotes the long-term survival of this endemic and vulnerable species.

Acknowledgements

We are grateful to PROBIO (grant number 2461-00/02), which is supported by FUNBIO, CNPq, and MMA, and administered by the Conservation International–Brazil. The federal universities of Minas Gerais (UFMG), Ouro Preto (UFOP) and Viçosa (UFV), and the Pontifical Catholic University of Minas Gerais (PUC-Minas) provided logistical support. We would also like to thank the owners of the Fazenda Serra Azul, who kindly provided food and accommodation. We are thankful to Edú

B. Guerra, Héctor Ramírez-Chaves, Jorge Luis Pino, Robert Forsyth and Guilherme Garbino for their valuable critiques and suggestions on an earlier version of the manuscript.

Authors' Contributions

Conceptualization: AC, TV, FU, FM. Formal analysis: AC, FU, FL. Funding acquisition: AC, FM, TV. Investigation: AC, HS, JL, DF, FU, FL, FM. Writing - original draft: DF, FU, AC, FL, FM, TV. Writing - review and editing: FM, FU.

References

- Barthelme EL (2016) Family Erethizontidae (New World Porcupines). In: Wilson DE, Lacher Jr. TE, Mittermeier RA (Eds.) Handbook of the Mammals of the world. Vol. 6. Lagomorphs and rodents I. Lynx Edicions, Barcelona, Spain, 372–397 pp.
- Buckland ST, Anderson DR, Burnham KP, Laake JL, Borchers DL, Thomas L (2001) Introduction to distance sampling: estimating abundance of biological population. Oxford University Press, Oxford, UK, 568 pp.
- Castilho LC, Martinez RA, Giné GAF, Ribeiro GC, Schiavetti A (2013) The thin-spined porcupine, *Chaetomys subspinosus* (Ro-

- dentia: Erethizontidae), within protected areas in the Atlantic Forest, Brazil: local knowledge and threats. *Tropical Conservation Science* 6: 796–810. <https://doi.org/10.1177/194008291300600607>
- Catzefflis F, Patton J, Percequillo A, Bonvicino CR, Weksler M (2017) *Chaetomys subspinosus*. The IUCN Red List of threatened species 2017: e.T4366A22213335. <https://doi.org/10.2305/iucn.uk.2017-2.rlts.t4366a22213335.en>
- Chiarello AG, Passamani M, Zortéa M (1997) Field observations on the thin-spined porcupine, *Chaetomys subspinosus* (Rodentia; Echimyidae). *Mammalia* 61: 29–36. <https://doi.org/10.1515/mamm.1997.61.1.29>
- Eisenberg JF, Redford KH (1999) *Mammals of the neotropics—the central neotropics: Ecuador, Peru, Bolivia, Brazil*. University of Chicago Press, Chicago, USA, 609 pp.
- Giné GAF (2009) *Ecologia e comportamento do ouriço-preto (Chaetomys subspinosus, Olfers 1818) em fragmentos de Mata Atlântica do município de Ilhéus, sul da Bahia*. PhD thesis, Universidade de São Paulo, Piracicaba, Brazil, 244 pp.
- Giné GAF, Duarte JMB, Faria D (2010) Feeding ecology of a selective folivore, the thin-spined porcupine (*Chaetomys subspinosus*) in the Atlantic Forest. *Journal of Mammalogy* 91: 931–941. <https://doi.org/10.1644/09-mamm-a-185.1>
- Giné GAF, Faria D (2016) *Chaetomys subspinosus* (Olfers, 1818). In: Escarlate-Tavares F, Valença-Montenegro MM, Jerusalinsky L (Eds.) *Plano de ação Nacional para a conservação dos mamíferos da Mata Atlântica Central*. Instituto Chico Mendes de Conservação da Biodiversidade, Brasília, Brazil, 99–105 pp.
- Giné GAF, Faria D (2018) Combining species distribution modeling and field surveys to reappraise the geographic distribution and conservation status of the threatened thin-spined porcupine (*Chaetomys subspinosus*). *PLoS ONE* 13: e0207914. <https://doi.org/10.1371/journal.pone.0207914>
- ICMBio (Instituto Chico Mendes de Conservação da Biodiversidade) (2018) *Livro Vermelho da fauna brasileira ameaçada de extinção: volume II – mamíferos*. Instituto Chico Mendes de Conservação da Biodiversidade, Brasília, Brazil, 622 pp.
- Kaizer MC, Alvim THG, Novaes CL, Mcdevitt AD, Young RJ (2021) Snapshot of the Atlantic Forest canopy: surveying arboreal mammals in a biodiversity hotspot. *bioRxiv* 2021.03.08.434374. <https://doi.org/10.1101/2021.03.08.434374>
- Melo FR, Lima F, Ferraz DS, Faria MB, Oliveira PA, Soares PC, Chiarello AG (2018) Primates of the valleys of the Rios Jequitinhonha and Mucuri, Brazil: occurrence and distribution. *Primate Conservation* 32: 95–108.
- Moojen J (1952) *Os roedores do Brasil*. Ministério da Educação e Cultura, Instituto Nacional do Livro, Rio de Janeiro, Brazil, 214 pp.
- Oliveira PA, Lima RBS, Chiarello AG (2012) Home range, movements and diurnal roosts of the endangered thin-spined porcupine, *Chaetomys subspinosus* (Rodentia: Erethizontidae), in the Brazilian Atlantic Forest. *Mammalian Biology* 77: 97–107. <https://doi.org/10.1016/j.mambio.2011.09.005>
- Oliver WLR, Santos IL (1991) Threatened endemic mammals of the Atlantic Forest region of south-east Brazil. *Jersey Wildlife Preservation Trust, Special Scientific Report* 4: 1–26.
- Ribeiro MC, Metzger JP, Martensen AC, Ponzoni FJ, Hirota MM (2009) The Brazilian Atlantic Forest: how much is left, and how is the remaining forest distributed? Implications for conservation. *Biological Conservation* 142: 1141–1153. <https://doi.org/10.1016/j.biocon.2009.02.021>
- Silva JMC, Casteleti CHM (2003) Status of the biodiversity of the Atlantic Forest of Brazil. In: Galindo-Leal C, Câmara IG (Eds.) *The Atlantic Forest of South America: biodiversity status, trends, and outlook*. Center for Applied Biodiversity Science and Island Press, Washington DC, USA, 43–59.
- SOS Mata Atlântica and INPE (2020) *Atlas dos remanescentes florestais da Mata Atlântica período 2018-2019 – Relatório técnico*. Fundação SOS Mata Atlântica and Instituto Nacional de Pesquisas Espaciais, São Paulo, Brazil, 61 pp. http://mapas.sosma.org.br/site_media/download/2020_Atlas_Mata_Atlantica_2018-2019_relatorio_tecnico_final.pdf. Accessed on: 2021-4-20.
- Voss RS, Hubbard C, Jansa SA (2013) Phylogenetic relationships of New World porcupines (Rodentia, Erethizontidae): implications for taxonomy, morphological evolution, and biogeography. *American Museum Novitates* 3769: 1–36. <https://doi.org/10.1206/3769.2>